Study program: bachelor academic studies of physics

level: Bachelor

Course title: Mathematical methods II

Lecturer (Name, middle letter, surname)**:** Mirjana N. Stojanovic

Status: obligatory

ECTS: 8

Requirements: Mathematical methods I

Learning objectives

Students obtain basic mathematical formalism which will enable them to follow, understand and conclude autonomously, further syllabus from mathematics, theoretical and mathematical physics as well as other fields in physics. Students are enabled to approach solving problems appearing in mathematical physics with understanding; Students should master the techniques, which are used in mathematics with applications in physics.

Learning outcomes

Developing general abilities and knowledge from the fields of series, differential and integral calculus of the functions of several variables and complex analysis, following the expert literature, selection of the most adequate solution of the problem in physics by mathematical models. Level of competence for independent and successful solving mathematical models, which are used in mathematics for further applications in physics.

Syllabus

Theoretical instruction

Series. Number series. Criteria for convergence (Cauchy, D'alamber,Abel, Raab). Conditional convergence. Funtional sequences and series. Properties of power series. Series expansions of functions. Fourier series. Convergence and calculation of Fouirer series. Real functions of several variables. Differential calculus. Limits and continuoity. Partial derivatives and their interpretation. Differentiability. Differential of the funcions and differentials of the higher order. Taylor formula. Partial derivatives of composite function. Derivative in direction, equation of tangent plane and normal on surfice. Extremes and conditional extremes. Theorems on implicit functions. Introduction to vector analysis. Vector function of one, two and three variables. Multiple integrals and change of variables in them. Curvilinear and surfice integrals of the first and second kind. Independence of curvilinear integral from the path of integration (example in physics). Formulas of Green, Gauss-Ostrogradski, Stokes. Field theory. Gradient, divergence, curl.

Integrals which depend on parameter: properties of continuoity, integrability and differentiability. Derivative of integrals which depend on parameter, case when bounds of integral depend on parameter. Inappropriate integrals and inappropriate integrals which depend on parameter. Integration of inappropriate integrals. Euler integrals. Fourier integral. Representation of functions by Fourier integral. Fouirer transformations. Function of complex variable. Analitical functions, elementary functions of complex variable. Cauchy-Riemann equations. Mapping by means of complex functions. Cauchy integral theorems. Cauchy integral formulas. Taylor series and applications. Isolating singularities, classification, properties. Laurent series. Residue theorem of functions and its application to calculation of integrals. Analytical continuation.

Practical instruction

Exercises , other forms of teaching, study research work.

Excercises follow the lectures. Homework, expected to be students' independent work, are obligatory and different. For high marks it is necessary to do a term paper using the Mathematica software package.

Literature (in Serbian)

1.O. Hadzic, Dj. Takaci, Mathematics for students of natural science, Novi Sad, Faculty of natural science, 1998.,Textbook.

2.D. Perisic, S. Pilipovic, M. Stojanovic, Function of several variables-differential and integral calculus, Uni. Novi Sad, Faculty of natural science, 1997.

3.D.N.Despotovic, Mathematics 2, Faculty of natural science, 1976, Textbook.

4.M. Stojakovic, Mathematical analysis 2, Belgrad, 2002, Textbook.

5.Lj. Gajic, N. Teofanov, S. Pilipovic, Collection of homeworks from analyse 2, second part, Uni. Novi Sad, FNS, 1998.

6.D.N.Despotovic, M. Budimcevic, Collection of solved problems from complex analysis, Uni Novi Sad,

<table>
<tr><td colspan="5">FNS, 1998.
7.Z. Kadelburg, D.Adnadjevic, Mathematical analysis 1 and 2, Nauka, Belgrad, 1998.
8.S. Radenovic, Mathematical analysis II, Collection of solved exam’s problems for preparation for exam, Belgrad, 1996.</td></tr>
<tr><td colspan="4">Weakly teaching load</td><td>Other</td></tr>
<tr><td>Lectures: 5</td><td>Exercises: 4</td><td>Other form of teaching:</td><td>Research work</td><td></td></tr>
<tr><td colspan="5">Teaching methodology
Lectures, Tutorials, Exercises.
Lectures (5 hours per week, during the semester), Exercises (4 hours per week, during the semester).</td></tr>
<tr><td colspan="5">Grading (maximum number of points 100)</td></tr>
<tr><td colspan="2">Pre-exam obligations</td><td>points</td><td>Final exam</td><td>points</td></tr>
<tr><td colspan="2">Activity during the lectures</td><td>5</td><td>Written exam</td><td>20</td></tr>
<tr><td colspan="2">Practical syllabus</td><td></td><td>Oral exam</td><td>50</td></tr>
<tr><td colspan="2">Colloquia</td><td>20</td><td></td><td></td></tr>
<tr><td colspan="2">homework</td><td>5</td><td></td><td></td></tr>
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